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Reply to R. A. Crowson's "Comments on Insecta of the Rhynie Chert" (1985 Entomol. Gener. 11 (1/2): 097—098)

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Greenslade, P. J. M. [Div. Entomol., CSIRO, Canberra/Australia]: **Reply to R. A. Crowson's 'Comments on Insecta of the Rhynie Chert' (1985 Entomol. Gener. 11 (1/2): 097—098).** — Entomol. Gener. 13 (1/2): 115—117; Stuttgart 1988. ——— [Report].

Crowson [1985] has resurrected his earlier suggestion [Crowson 1970] that the fossils *Rhyniella* Hirst & Maulik 1926 (Collembola) and *Protacarus* Hirst 1923 (Acarina) from the Devonian Rhynie Chert, are recent contaminants and are not genuine components of the Devonian fauna. He made 3 points in support of his argument which I examine here with particular reference to the Collembola, since I am not qualified to comment on the mite. I show that the arguments put forward by Crowson are without foundation and therefore support Kühne & Schlüter's [1985] contention that there is at present no intrinsic proof of the contaminant theory.

(1) Crowson says first that the drawings of *Rhyniella* appear to be of 'shrivelled' specimens suggesting that they dried out before fossilisation took place. I have examined all the specimens of Collembola and do not consider this to be true. The fossils consist of what seems to be cuticle and some internal sclerotised structures preserved in the matrix; although the specimens are distorted, they are not shrivelled. Their appearance is similar to that of modern animals which have decayed slightly in water before preservation; the soft internal structures have disappeared and most setae seem to be missing. Had they shrivelled through dehydration, they would have contracted heads, appendages and bodies. In fact, the heads, antennae, legs, abdominal segments and furca are, if anything, expanded rather than contracted [Scourfield 1940 b: Fig 5, 9, 11; Whalley & Jarzembowski 1981: Fig 1]. The one specimen that is contracted is number 38230 [Scourfield 1940 b: Fig 7 a, b], but gut contents are clearly visible in this specimen. These are not normally present in resting individuals that have become dehydrated [Poinsot-Balaguer & Barra 1984].

(2) Crowson [1970] also states that *Rhyniella* "belongs to a group of Collembola which is characterised, among other things, by the complete loss of the 'spring tail' or furcula", and later [Crowson 1985], that the fossil Collembola and Acarina "appear to be very similar structurally to dominant and widespread modern representatives of their groups". He gives no authorities for these statements, but I assume that he is referring to Massoud's [1967] identification of *Rhyniella* as belonging to what is at present believed to be an advanced family of poduromorph Collembola, the Neanuridae [Massoud 1976]. With reference to the first statement, there is no mention in the literature on *Rhyniella* of the absence of furca. Only heads and thoraxes were found initially; an abdomen was discovered later which is complete with furcula [Whalley & Jarzembowski 1981].

Concerning the family identification of *Rhyniella* and its phylogenetic relationships, a small number of examples not listed by Scourfield [1940 a, b] or earlier authors have been located on chert chips which were part of the original collection and detailed redescriptions of all specimens are being prepared. It must be stressed that the taxonomic status of the specimens is by no means certain, and they are currently

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different phases of deposition. Crack boundaries could be detected by their bleached nature as a result of subaerial exposure, the presence of breccia in the infilled cracks, and signs of crumbling or chemical etching in the lining wall.
In conclusion, on the evidence available as given above, the contaminant theory seems unlikely.

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References

Christiansen, K. [1971]: Notes on Miocene amber Collembola from Chiapas. — Univ. Calif. Publ. entomol. **63**: 45—48.

Clayton, C.J. [1983]: The chemical environment of flint formation in Upper Cretaceous chalks. In: The Scientific Study of Flint and Chert. Ed. G. de G. Sieveking and M.B.Hart. — Cambridge University Press, Cambridge/United Kingdom.

Crowson, R. A. [1970]: Classification and Biology. — Heinemann, London/United Kingdom.

Crowson, R. A. [1985]: Comments on Insecta of the Rhynie Chert. — Entomol. Gener. **11**: 097—098; Stuttgart.

Greenslade, P. [1986]: Rhyniella praecursor — the earliest known hexapod, a new assessment of its phylogenetic position. — In: Dallai, R. (ed.): Proceedings of the Second Seminar on Apterygota, Siena, 1986: 319—323; University of Siena, Italy.

Hirst, S., & Maulik, S. [1926]: On some arthropod remains from the Rhynie Chert (Old Red Sandstone). — Geol. Mag. **63**: 69—71.

Kühne, W. G., & Schlüter, T. [1985]: A fair deal for the Devonian arthropoda fauna of Rhynie. — Entomol. Gener. **11**(1/2): 091—096; Stuttgart 1985.

Mari Mutt, J. A. [1983]: Collembola in amber from the Dominican Republic. — Proc. Entomol. Soc. Wash. **85**(3): 575—587.

Massoud, Z. [1967]: Contribution à l'étude de Rhyniella praecursor Hirst et Maulik 1926, Collembole fossile du Dévonien. — Rev. Ecol. Biol. Sol. **4**(3): 497—505.

Massoud, Z. [1976]: Essai de synthèse sur la phylogénie des Collemboles. — Rev. Ecol. Biol. Sol. **13**(1): 241—252.

Poinsot-Balaguer, N., & Barra, J. A. [1984]: Role du jeune dans la résistance à la sècheresse et au froid chez les collemboles. — Bull. Soc. Ecophysiol. **9**(2): 165—178.

Scourfield, D. J. [1940a]: The oldest known fossil insect. — Nature **145**: 799—801; London/United Kingdom.

Scourfield, D.J. [1940b]: The oldest known fossil insect (Rhyniella praecursor Hirst & Maulik) — further details from additional specimens. — Proc. linn. Soc. 1939—40, **25**(2): 113—131; London/United Kingdom.

Shear, W.A., Bonamo, P.M., Grierson, J.D., Ian Rolfe, W.D., Laidlaw-Smith, E., & Norton, R.A. [1984]: Early land animals in North America: evidence from Devonian age arthropods from Gilboa, New York. — Science **224**: 492—494.

Tasch, P. [1957]: Flora and Fauna of Rhynie chert: a paleoecological reevaluation of published evidence. — Univ. Wichita Bull. (No 36) **32**: 3—23.

Whalley, P., & Jarzembowski, E. A. [1981]: A new assessment of Rhyniella, the earliest known inscect, from the Devonian of Rhynie, Scotland. — Nature, Lond. **291**: 317.

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